

the Thinker," describing the evolution of his religious belief; "Man the Discoverer and Inventor," treating of the progress of science. The treatment is essentially popular, and the wide knowledge of the writer, his pleasant style, and his skill in weaving into the narrative a store of interesting allusion and anecdote, render it an admirable introduction to the study of anthropology in its varied aspects. A series of well-selected illustrations, including the recently discovered frescoes in the French caves, with a useful bibliography, adds to its interest and value.

The present revision of the book is, on the whole, satisfactory. Detailed discussion of the complex problems of the past and future of man cannot be expected in a manual. But when mention is made of "the most ape-like" Piltdown skull, we might have anticipated at least a reference to the discoveries at Galley Hill and Ipswich. Some of the derivations, like those of "ship" and "gold" might be improved from Sir J. Murray's Dictionary. If he supposes that the modern Naga tribe in India are, like their forerunners of the same name, serpent worshippers, he is mistaken; and the taboo on the use of dry wood as fuel does not extend to the people of Berar, but to a single sacred grove. A curious press error gives the name of the Hindu sun-god Surya as "Sueya."

On the whole, this veteran anthropologist is to be congratulated on a book which, in its revised form, is certain to secure a new lease of popularity.

*The School and College Atlas.* One hundred and three maps, physical, political and commercial. Index. (London: G. W. Bacon and Co., Ltd., n.d.) Price 3s. 6d. net.

THIS Atlas is curiously unequal, for it contains a mixture of old style and new style maps; some maps are overcrowded with names, others are of striking simplicity. The summary maps dealing with temperatures are in some cases much too complicated. The colour-printed maps, showing relief on the layer system, indicate by the defective fit of the contours how difficult such cartographic work really is. For an atlas of this size the index is much too small.

The vegetation, annual and seasonal rainfall maps should prove of value, and the isotherms for the British Isles are based on actual temperatures and embody the latest official figures of the Meteorological Office.

B. C. W.

*The British Revolution.* By Dr. R. A. P. Hill. Pp. xii+116. (Cambridge: University Press, 1914.) Price 2s. net.

THE most striking feature of most political discussions is, Dr. Hill considers, an entire lack of first principles, and he proceeds to enunciate a "synthetic" principle, which he claims stands alone in uniting individualism and socialism, home rule and imperialism, actuality and the ideal, and many other opposed views. He also remarks that one of his objects is to supplant Herbert Spencer's synthetic philosophy, or rather to supplement it by the principles of the German school.

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## LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

### Dynamical Units for Meteorology.

IN the current number of the Quarterly Journal of the Royal Meteorological Society I have put forward a proposal for a name for a unit of acceleration, and shown how the introduction of such a unit leads up to the unit of potential which is required in the discussion of certain problems in aerodynamics. It has been suggested to me that as the proposal does not concern meteorologists alone it should be canvassed in a journal which is read by other physicists. I have written the following notes in the hope that you will be able to find room for them in NATURE.

The convenience of special names for such units as the *radian*, the *erg*, and the *volt*, is universally admitted. No apology is therefore needed for bringing forward a proposal for the adoption of a special name for a unit of acceleration. The particular unit for which a name is, I think, required is one decametre per second per second. This unit is slightly greater than the acceleration due to gravity at any point on the earth's surface, but so slightly that there is no difficulty in getting a clear conception of it. In this way it compares favourably with such units as one centimetre per second per second, or one foot per second per second. In accordance with the custom of honouring the pioneers of science by attaching their names to the units which occur in the branches which they discovered, it would be natural to name the unit of acceleration after Galileo. Unfortunately so long a name could not be used in forming compound names; I propose, however, to preserve the association of ideas by calling the unit a "leo." Accordingly I define the *leo* as the acceleration one decametre per second per second.

The acceleration of a falling body due to gravity and the earth's rotation is less than one leo by about 2 per cent.; the magnitude of the acceleration for various latitudes is shown in terms of the leo in the following table:—

|                             |     |             |
|-----------------------------|-----|-------------|
| Acceleration at the equator | ... | 0.9780 leo. |
| „ in latitude 45°           | ... | 0.9806 leo. |
| „ at London                 | ... | 0.9812 leo. |
| „ at the poles              | ... | 0.9832 leo. |

Smaller accelerations may be expressed in terms of the same unit or in terms of smaller derived units; thus a vehicle which attains a velocity of 10 metres per second in 10 seconds from rest has an average acceleration 0.1 leo or 1 decileo. The unit of the c.g.s. system, 1 cm./sec.<sup>2</sup> is, of course, identical with the millileo.

Turning to units of *force*, we find it natural to call the force which gives an acceleration of one leo to the mass one gram, a *leogram*. The leogram is identical with the kilodyne, but the new name makes the unit easier to realise, as it is seen to be slightly greater than the weight of one gram. In the same way the names, leokilogram and leoton, speak for themselves much better than megadyne and kilomegadyne.

For *pressure*, units with simple names, the bar and its sub-multiples exist already, but it is not very easy for meteorologists who have not devoted much attention to theoretical dynamics to realise the meaning of the standard definition 1 bar = 1 megadyne per sq. cm. Perhaps the phrase 1 leokilogram per sq. cm. will be found easier to grasp. The millibar, which

is the most convenient unit for stating barometric pressures, is 1 leogram per sq. cm. The c.g.s. unit of pressure is the microbar, which is equal to 1 leomilligram per sq. cm.

Prof. McAdie, in the issue of NATURE of March 19, 1914, referred to the use by chemists of the word bar as a name for this c.g.s. unit of pressure. The bar of the chemist is the millionth part of the unit, mentioned in the last paragraph, which has been taken into use by Bjerknes and other meteorologists under that name. I do not wish to discuss here the merits of the question raised by Prof. McAdie. It is perhaps a matter for some international assembly attended by representatives of both chemistry and meteorology.

Coming now to units of work, we see that there is no difficulty in defining the leogrammetre as the work done by a leogram when its point of application moves through a metre. Names of this sort can be used in explaining the terms which are in use already for quantities of energy. Thus the leomilligramcentimetre is identical with the erg, the c.g.s. unit. The theoretical unit of electric energy, the joule, is 1 leokilogramdecimetre, whilst the commercial, or "Board of Trade" unit, defined as 1 kilowatthour, is  $3600 \times 1000$  joules, or 360 leotonmetres.

Finally, we have to consider units of gravitational potential. The usual definition of potential is potential energy per unit of mass. The change of potential of 1 gram moved through one metre against a field of force sufficient to produce in it an acceleration one leo is one leogrammetre per gram, or briefly, one leometre. The difference in potential between two horizontal surfaces a metre apart depends on the latitude; it is 0.9780 leometre at the equator, and 0.9832 leometre at the poles.

The name leometre is proposed as an alternative to Prof. Bjerknes's "dynamic metre"; accordingly, it may not be out of place to conclude this letter by quoting the professor's note from the Quarterly Journal of the Royal Meteorological Society:—

"Names may be attacked from many points of view, and, even if left in peace during six years, they may be attacked in the seventh. Therefore a change in terminology contains a great risk. Still, I am willing to take the risk, if some guarantee can be obtained securing the prospects of the new terminology. I therefore take this opportunity to request everyone intending to attack the 'leometre' not to postpone the attack, but to execute it at once."

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### Aristotle's Physics.

THE review of Prof. Duhem's new book, "Le Système du Monde," over the initials, J. L. E. D., in NATURE of May 28, contains what purports to be a correct and intelligible summary of Aristotle's dynamics. It begins with the surprising words, "In his dynamics the idea of mass does not enter," and speaks loosely of motion as though Aristotle was treating of a varying velocity.

Sir George Greenhill and I both wrote to you on January 2, 1914 (vol. xcii., p. 584), pointing out that Aristotle throughout treats only of the motion of projectiles, and of that only in a resisting medium, and then only of that part of the vertical motion when the projectile has attained that constant speed known to ballisticians as "terminal velocity," which can be as readily observed in rising smoke as in falling rain.

The equation on which Aristotle really bases his ballistics is:—

$$H = f \left( \frac{wg}{A\tau k} \right),$$

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where H is the Newtonian terminal velocity,  $w$  is the weight of the projectile,  $A$  is the cross section of the projectile,  $\tau$  is the density of the medium,  $k$  is the coefficient of shape.

In modern ballistic tables we write for the unit projectile:—

$$p = \frac{k v^n}{g}$$

Aristotle put  $n$  equal to unity.

We now know that there can be no simple equation for vertical motion in a resisting medium except by assuming that  $n=1$  or 2.

Whilst he was in England last week for the Roger Bacon celebrations at Oxford, I mentioned this subject to Father David Fleming, O.F.M. He gave me permission to say that during his tenure of the chair of philosophy at the Franciscan House of Studies in the University of Ghent, he taught the equation as I have given it as the obvious and only true meaning of Aristotle's own words. J. H. HARCASTLE.

### Phenomena of the Conscious and Unconscious.

NOR very long ago the province of psychology was supposed to be confined to the study of the phenomena of consciousness. Recently, however, its narrow limits have been allowed to be transcended; but even now the vast majority of psychologists is so exclusively occupied in inquiring into the effect of the conscious on the unconscious that scarcely any amount of justice has been done to the study of the influence of the unconscious on the conscious. Yet this latter inquiry is by no means insignificant. In fact, it counts for more and more. It is not merely that some actions, unconscious in the beginning, gradually become conscious through the constant interference of volition, and *vice versa*. It is that the entire range of conscious activity is in essence reflex. The conscious, which is the superstructure of our mental life, has for its underground substratum the unconscious which moulds its shape and guides its course. Thus the conscious, which, superficially viewed, seems to control and modify reflexes is, in fact, itself a species of reflex.

The bare statement of this doctrine may look rather crude; but the grounds which substantiate it are rather of a speculative nature, and to dwell on them would not be quite appropriate in this journal. My aim, however, is different. I am not unaware of the rival theory which maintains that all human actions are essentially voluntary and have become reflex only by practice in the lifetime of the individual or of the race. What I desire by publishing this letter in NATURE is to elicit the opinions of physiologists as to the merits of the latter theory. To expect exact scientific evidence here is, of course, absurd. But are there even the remotest indications in the human and animal organism that favour this theory?

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### THE NATIONAL PHYSICAL LABORATORY IN 1913-14.

THE annual report of the National Physical Laboratory for 1913-14 was presented to the general board at the visitation day of the Royal Society on June 19. The report forms another and a conspicuous testimony to the remarkable growth of the laboratory and the importance and volume of the work with which